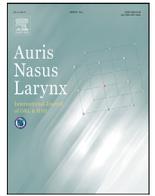




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## ENT manifestation in COVID-19 patients

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### ABSTRACT

**Objective:** to detect, analyze and discuss the different ear nose throat (ENT) manifestations those were reported in COVID19 positive patients in the reviewed and published literatures.

**Methods:** We performed a search in the PubMed databases, Web of Science, LILACS, MEDLINE, SciELO, and Cochrane Library using the keywords; COVID-19, Novel coronavirus, corona, 2019-nCoV, SARS-CoV-2, ENT, ear, nose, throat, otorhinolaryngology, ORL, pharynx, ORL, smell, larynx, different ENT related symptoms. We reviewed published and peer reviewed studies that reported the ENT manifestations in COVID-19 laboratory-confirmed positive patients.

**Results:** within the included 1773 COVID-19 laboratory-confirmed positive patients, the most common ENT manifestations of COVID-19 were sore throat (11.3%) and headache (10.7%). While the other reported ENT manifestations were pharyngeal erythema (5.3%), nasal congestion (4.1%), runny nose or rhinorrhea (2.1%), upper respiratory tract infection (URTI) (1.9%), and tonsil enlargement (1.3%).

**Conclusion:** ENT manifestations for COVID-19 are not common as fever and cough. But, a universal questionnaire using well-defined COVID-19 manifestations is needed to make the COVID-19 data precisely defined, complete and homogenous.

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## Introduction

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), firstly known as the 2019 novel Coronavirus (2019-nCoV), started in Wuhan in China at December 2019 [1]. Since that moment, the new virus, also known as Coronavirus Disease 2019 (COVID-19), has dramatic spread all over the world crossing all countries' borders till the World

Health Organization (WHO) confirmed it as a pandemic disease on March 11, 2020 [2].

The COVID-19 is part of the species of the SARS-related coronaviruses that have led to previous epidemics over the last two decades as SARS-CoV in 2002–2003 in China [3] and the Middle East Respiratory Syndrome (MERS-CoV) in 2012–2013 in Saudi Arabia [4].

The COVID-19 is presented mainly by lower respiratory tract related symptoms such as fever, cough, dyspnea and chest tightness that could progress rapidly to acute respiratory distress syndrome (ARDS) [5]. However, COVID-19 causes

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**Table 1**  
ENT manifestations in COVID-19 patients.

Study	Number of cases	nasal congestion	runny nose or rhinorrhea	Nasal obstruction	Smell	Pharyngeal erythema	URTI	Sore throat	Headache	Tonsil enlargement
swelling										
Wang et al. [7]	4	1	1							
Guan et al. [8]	1099	53				19		153	150	23
Chen et al. [9]	99		4					5	3	
Xia et al. [1]	20		3					2		
Chang et al. [10]	13	8	1						3	
Zhang et al. [11]	9	1	1					1		
Lu et al. [12]	171	9	13			79	33			
Vaira et al. [6]	72		13	11	44			37	30	
Baggett et al. [13]	147		2							
Qiu et al. [14]	36					1		2	3	
Speth et al. [15]	103			50	63					
Total	1773	72 (4.1%)	38 (2.1%)	61 (3.4)	107 (6%)	98 (5.5%)	33 (1.9%)	200 (11.3%)	189 (10.7%)	23 (1.3%)

also different upper respiratory tract related symptoms including nasal congestion, sore throat and smell dysfunction [6].

The available data on the ear nose throat (ENT) manifestations of COVID-19 is sparsely published and out of the best of our knowledge, no previous review study to collect and describe the ORL manifestation in COVID-19 positive patients. Thus, the aim of the current work was to detect and discuss the different otorhinolaryngology (ORL) manifestations those were reported in COVID-19 positive patients in the reviewed and published literatures.

## Patients and Methods

We searched several medical databases, including PubMed databases, Web of Science, LILACS, MEDLINE, SciELO, and Cochrane Library at April 2020 to find out relevant articles. We used the following keywords; COVID19, COVID-19, Novel Coronavirus, corona, 2019-nCoV, SARS-CoV-2, ENT, ear, nose, throat, ORL, otorhinolaryngology, larynx, pharynx, and different ENT related symptoms which are; sore throat, dysphagia, voice disorder, hoarseness, stridor, smell dysfunction, anosmia, nasal obstruction, nasal discharge, runny nose, hearing loss, deafness, ear ache, and otalgia.

We focused our review on studies reporting the ENT manifestations in COVID-19 laboratory-confirmed positive patients. We included studies that demonstrate the incidence of ENT related manifestation among different general manifestations such as fever, cough and shortness of breath in laboratory-confirmed positive COVID-19 patients. Non-published studies and studies that were not published in indexed journals or published without peer review, studies that did not describe the ENT symptoms at time of presentation, studies that focus on one manifestation only, studies that include suspected cases beside confirmed cases and the studies that are not available in English language were excluded from the study. Then the authors collected, tabulated and analyzed the results of the studies that met these inclusion and exclusion criteria.

This study was conducted according to the declaration of Helsinki on Biomedical Research Involving Human Subjects.

## Results

Among large number of red papers on COVID-19, eleven reviewed and published studies met the inclusion and exclusion criteria of the current review and reported ENT manifestation in COVID-19 positive patients [1,7–15] (Table 1, 2). These studies include 1773 COVID-19 laboratory-confirmed positive patients. Runny nose or rhinorrhea was reported in 38 patients (2.1%), nasal congestion was detected in 72 patients (4.1%), smell affection was documented in 107 patients (6%), nasal obstruction was manifested in 61 patients (3.4%), sore throat was reported in 200 patients (11.3%), pharyngeal erythema was documented in 98 patients (5.3%), tonsil enlargement was noticed in 23 patients (1.3%), headache was presented in 189 patients (10.7%), and URTI was reported in 33 patients (1.9%) (Table 1, Fig. 1)

In these analyzed studies, we found that non-ENT manifestation were the main and much more common than the ENT manifestations including fever (1303 patients, 73.5%), cough (1080 patients, 61%), expectoration (405 patients, 22.8%), dyspnea/shortness of breathing (288 patients, 16.2%), hemoptysis (10 patients, 0.6%), chest pain (2 patients, 0.1%), nausea/ vomiting (69 patients, 3.9%), constipation (2 patients, 0.1%), diarrhea (75 patients, 4.2%), malaise/ fatigue (484 patients, 27.2%), and myalgia/arthritis (185 patients, 10.4%) (Table 2, Fig. 2) Fig 3.

No reported sneezing, epistaxis, post nasal discharge, facial edema or tenderness, diminution of hearing, vertigo, hoarseness, or stridor.

So the most common ENT manifestations for COVID-19 were sore throat (11.3%) and headache (10.7%). It was found that the incidence of the ENT manifestation in COVID-19 patients is not as high as fever and cough. But, it was reported that nasal congestion (4.1%) and pharyngeal erythema (5.3%) were reported to occur in nearly similar incidence to the occurrence of diarrhea in those patients (4.2%).

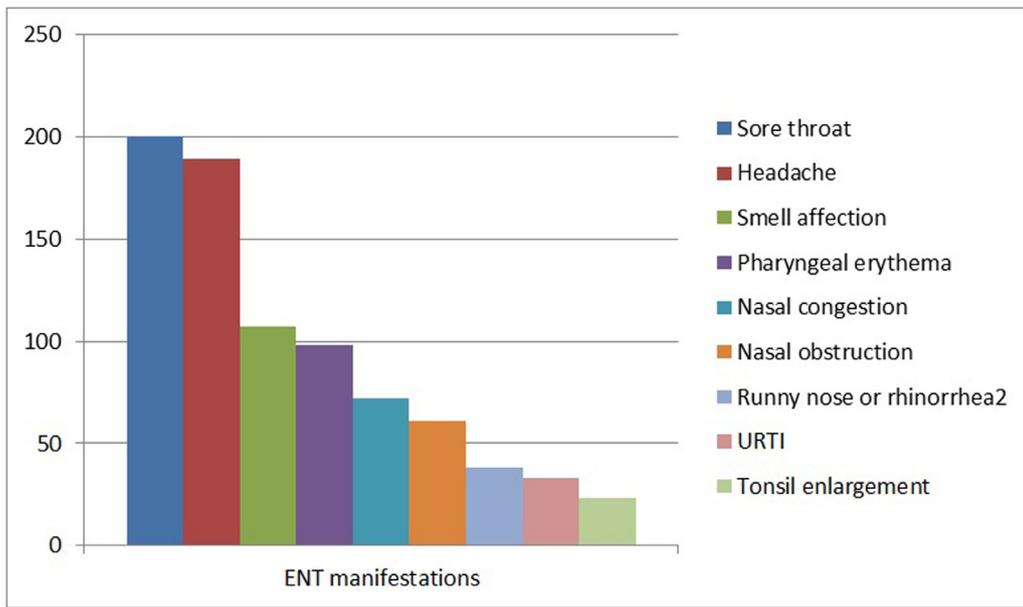


Fig. 1. chart shows incidence of ENT manifestations in COVID-19 patients.

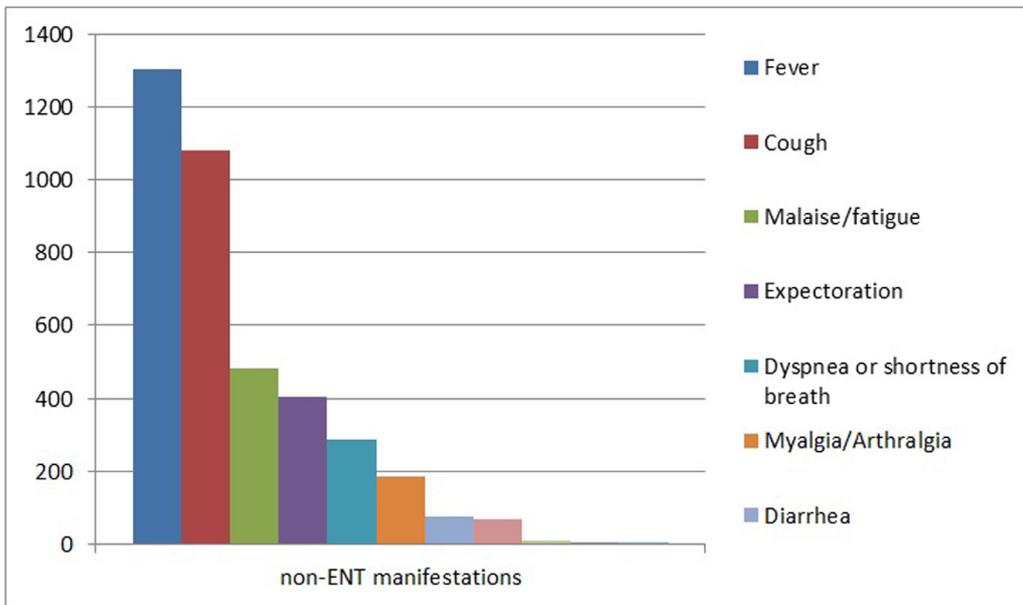


Fig. 2. chart shows incidence of non-ENT manifestations in COVID-19 patients.

## Discussion

In December 2019, a novel coronavirus (CoV) epidemic, caused by the severe acute respiratory syndrome coronavirus – 2 (SARS-CoV-2) emerged from China [8]. On February 11, 2020, the WHO pronounced the disease produced by this new virus as COVID-19. The widespread distribution and infectivity of COVID-19 make it an important pathogen with an unrestricted health threat [16].

COVID-19 manifests with a wide clinical spectrum ranging from no symptoms to septic shock and multi-organs dysfunctions [17]. Despite its rapid spread worldwide, the clinical characteristics of COVID-19 remain to a large extent vague [8].

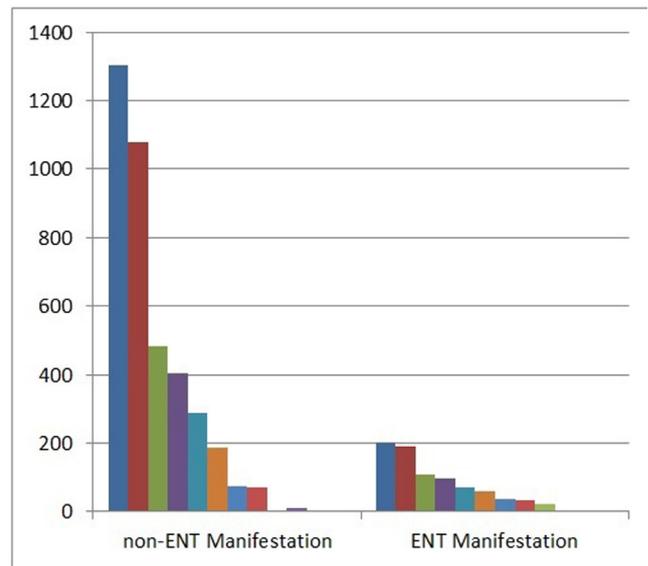
The nasal, nasopharyngeal and/or the oropharyngeal tissue is one of the main harbor sites of the infection, main site of taking the sample for testing and a main source of transmission of infection. However, most published COVID-19 researches are focused on the lower respiratory tract manifestation and sequels due to their life-threatening nature.

While, the literature on ENT manifestation during COVID-19 infection is still sparse, thus, there is value in studying ENT manifestations of such novel virus and there is a need to identify the defining ENT epidemiological and clinical characteristics with more precision.

In the current review of literatures, we tried to collect the data concerning the ENT manifestations in the laboratory-confirmed COVID-19 cases in only the peer reviewed and

**Table 2**  
The common manifestation in the included COVID-19 patients.

Study	Number of cases	Fever	Cough	Expectoration	dyspnea or shortness of breath	Hemoptysis	chest pain	Nausea / vomiting	Constipation	Diarrhea	Malaise/ fatigue	Myalgia/ Arthralgia
Wang et al. [7]	4	4	3						2			3
Guan et al. [8]	1099	966	744	367	204	10		55		41	419	163
Chen et al. [9]	99	82	81		31		2	1		2		11
Xia et al. [11]	20	12	13		2			2		3		1
Chang et al. [10]	13		6	2						1		3
Zhang et al. [11]	9	8	5							1	4	4
Lu et al. [12]	171	71	83					11		1	13	
Vaira et al. [6]	72	69	60							15		
Baggett et al. [13]	147	1	11	2						8	48	
Qiu et al. [14]	36	13	7	1						2		
Speth et al. [15]	103	76	70	36	48					2		
<b>Total</b>	<b>1773</b>	<b>1303(73.5%)</b>	<b>1080 (61%)</b>	<b>405 (22.8%)</b>	<b>288 (16.2%)</b>	<b>10 (0.6%)</b>	<b>2(0.1%)</b>	<b>69(3.9%)</b>	<b>2 (0.1%)</b>	<b>75 (4.2)</b>	<b>484 (27.3)</b>	<b>185 (10.4%)</b>



**Fig. 3.** chart shows incidence of ENT and non ENT manifestations in COVID-19 patients.

published papers to provide an up-to-date delineation of the otorhinolaryngology (ORL) clinical characteristics of COVID-19 patients to help ENT doctors to understand and approach such cases and assist in building up the ENT data for this novel disease.

The results of the current study agree with previous reports [7, 18] that fever (reported in 73.5% of the included patients), and cough (reported in 61%) are the dominant symptoms of COVID-19 whereas gastrointestinal and ENT symptoms were uncommon, proposing the difference in viral tropism as compared with influenza, SARS-CoV, and MERS-CoV [8].

The most common ENT manifestations for COVID-19 in the current study were sore throat (11.3%) and headache (10.7%). However, it is clear that their incidence is much less than the incidence of fever and cough in COVID-19 patients. On the other hands, nasal congestion (4.1%) and pharyngeal erythema (5.3%) were reported to occur in nearly similar incidence to the occurrence of diarrhea in those patients (4.2%). While, runny nose or rhinorrhea was reported in only 2.1% of COVID-19 patients. Therefore, if we choose one ENT manifestation to be added to the definition of suspected cases or the triage check list for covid-19, we will choose the sore throat and not the runny nose. While sore throat was found in COVID-19 patient in higher incidence than diarrhea that is included in some triage checklists for COVID-19, so this needs to be revised.

All the reported ENT manifestations in COVID-19 patients are nonspecific and so could be easily missed and no emergency ENT symptoms as bleeding per nose or throat or stridor was reported in COVID-19 cases. No ear or laryngeal manifestations were documented. No reported sneezing, epistaxis, or post nasal discharge so the role of the nose in disease transmission appeared to be much less than cough.

Post viral anosmia is one of the chief reasons of smell dysfunction in adults (40% of cases of anosmia). Viruses that give rise to the common cold or upper respiratory tract in-

fections are well known to cause post-infectious smell loss. The previously described coronaviruses are assumed to account for 10–15% cases [19]. So, the novel COVID-19 virus supposed also to be able to cause anosmia in infected patients and if it occurs, it will not be a specific finding.

Smell and taste dysfunctions in COVID-19 patients were sparsely mentioned in the literature and there is still a paucity of peer-reviewed literature to support a causal association between anosmia and COVID-19 [20]. Moreover, most studies on smell in COVID-19 patients did not fully describe the clinical manifestations of the patients so we could not include in the current review.

In a non-peer reviewed published paper; Menni et al. [21] found that loss of smell and taste were encountered in 59% of COVID-19 positive patients compared to 18% of those with COVID-19 negative test. They suggested that a combination of loss of smell and taste, fever, persistent cough, fatigue, GIT symptoms is a predictive of COVID-19 positive test with good specificity (0.86) and average sensitivity (0.54). But they don't know whether anosmia was developed prior to other COVID-19 symptoms, during the illness or afterwards.

Selected studies in the current review demonstrate different manifestations of COVID-19 patients including ENT manifestations. However, it was found that smell and taste dysfunctions are important manifestations in other specific studies that focus on them and not include other manifestation or included suspected and not laboratory confirmed COVID-19 cases.

Varia et al. [6] performed objective smell and taste tests were performed on 72 patients with positive PCR for COVID-19 and with no previous history of smell and taste dysfunction. They found that 73.6% of patients had smell or taste dysfunction during the course of the COVID-19 with 14.4% had isolated olfactory dysfunctions.

Lechien et al. [22] study is the first peer-reviewed multi-center study, reporting 85.6% olfactory dysfunction. But, they used a questionnaire focused on the psychological and social burden of smell disorders, particularly with the COVID-19 pandemic scenario and the subsequent social life restrictions in, might lead to overestimation [23].

Kaye et al. [24] report on 237 US patients with COVID-19 and found that 73% reported anosmia, and that loss of sense of smell was the initial symptom in 26.6%.

In the current review, smell affection was reported in 6% of included patients. While Mao et al. [25] found out anosmia in 5.1% of their studied cases. However, later studies show much higher incidence. Most COVIDS-19 studies did not mention the smell affection particularly the early and primary reports and most COID-19 patients (66%) reported a complete recovery of their chemosensitive functions during the course of the disease [24].

So it was recommend considering patients with anosmia without nasal obstruction or runny nose as COVID-19 suspicion and recommending initiating testing or self-isolation for them [24].

Auditory manifestation was not reported in the studies on COVID-19 and auditory complication due to coronavirus is little mentioned in the literature. In a previous report on other

coronavirus infection [26], brainstem involvement was observed and the neuro-auditory problem is a possible. While in the study of Mustafa [27], COVID-19 infection could have deleterious effects on cochlear hair cell functions despite being asymptomatic as reduction of high frequency pure-tone thresholds as well as the TEOAE amplitudes were detected.

## Limitations

The serious health emergency of COVID-19 situation makes data collection and analysis very difficult. Thus, the current study shares the same limitations that usually met during studies on the novel virus; COVID-19. First, incomplete documentation of the manifestations without universal precise definition of the clinical manifestations, second variation in the methods and structure of clinical data collection rapidly from time to time even between weeks and from a country to another and from a study to another and there is no used universal questioner for those patients Third, most papers missed asymptomatic or mild cases managed at home. Fourth; the COVID-19 diagnosis is based on the RT-PCR test that is not fully sensitive and inadequate sample collection may decrease test sensitivity [28]. More accurate diagnostic tests would offer a more accurate diagnosis and so the results might differ. Fifth; there is no available data on the sequential appearance of the ENT manifestation or clear description and definition of the COVID-19 manifestation. Sixth; there is no available ENT endoscopic or radiological data in the published papers. All these limitations are characteristics of all the published researches on COVID-19 up till now and should be considered in the futures researches.

A slandered universal questionnaire for well-defined COVID-19 manifestations is needed to make the COVID-19 data well defined, complete and homogenous. We hope that this article will serve as a start for further research into the ENT implications of human COVID-19 infections. As the current epidemic continues, a better understanding of the virus will emerge, hopefully with more emphasis on research into the relationship between COVID-19 and ENT manifestations. This understanding will not only help to guide infection control measures but can also provide insights diagnostic features of the ENT manifestations and the possible ENT sequels and the feasibility of different ORL tissues as a medium of diagnosis.

It is highly recommended to reevaluate the recovered patient from COVID-19 and become negative for late sequels of the disease including the ORL examination and radiology because the late sequels of the COVID-19 infection after being negative need also to be evaluated.

## Conclusion

ENT manifestations for COVID-19 are not common as fever and cough. But, a universal questionnaire using well-defined COVID-19 manifestations is needed to make the COVID-19 data precisely defined, complete and homogenous.

## Declaration of Competing Interest

The authors declare no conflict of interest and do not have any potential financial conflict of interest related to or could influence this work.

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